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An Economic Report on the Production of KONA COFFEE

JOSEPH T. KEELER, JOHN Y. IWANE, AND DAN K. MATSUMOTO

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INTRODUCTION

This study was made during the crop year 1955–56 and represents the situation as it existed during that period only. Whereas the cost of production probably has changed very little since 1956 or has increased slightly, a drastic change downward has occurred in coffee prices. Thus, the cost and return figures presented here were recorded in a more favorable economic environment than that which existed in 1958.

PURPOSE OF STUDY

The primary objective of this cost study was to ascertain what exists with respect to costs and returns on Kona coffee farms. As with other cost studies of this type, it was not designed to yield specific information as to how much of any given resource to use on a particular farm. It does, however, furnish the farm manager or decision maker with a basis from which he can decide what constitutes the wise use of his resources with due regard to how closely his conditions approach those of the farms shown in the study.

Cost of production figures provide the necessary economic information on which other researchers can determine the effects their innovations will have on the production of coffee. Cost information also pinpoints areas where further research can profitably be made.

Farmers are often vitally affected by the actions of their legislators. This is particularly true where legislation concerns such subjects as taxation, prices, or minimum wage standards. Legislators need objective information such as that provided by cost studies if they are to accurately appraise the effects of proposed changes in our laws.

METHODS USED

During the latter part of 1954, the possibility of a cost of production study was discussed with Kona coffee growers. Following this, cost of production records and other cost materials were designed and printed. Farmers were contacted in the various areas within the Kona district and their cooperation solicited for a cost-of-production study. Twenty growers undertook to keep cost records and of that number 15 were completed. Because a careful account must be kept of all labor inputs, records of this type are difficult for farmers to keep. For this reason no attempt was made to select a random sample as might have been done otherwise. However, the group of record keepers on which this study was based varied widely on such factors as location, size of holding, and financial resources, and represented a fairly typical cross section of Kona coffee farmers.

During the 1955 crop year, periodic visits were made to assist farmers with their record problems. When the harvest season approached, special labor cards were distributed to farmers which allowed them to account for the activities of both family and hired labor by individual picker. A careful record was kept of the hours each picker put in and how much he picked. Where children assisted in the picking operation, their time was recorded in proportion to their capability as related to an adult.

During the first part of 1956 or when the picking operation was completed, each farmer was interviewed for specific information on his acreage, valuation and life left on buildings and machinery, status of lease, etc. The records of each farmer were checked and discussed with him.

THE POSITION OF COFFEE IN THE AGRICULTURAL ECONOMY OF THE TERRITORY

In the diversified agriculture of the Territory, which includes all agriculture other than sugar and pineapple, coffee holds a very prominent place economically. In 1956 the value of the coffee crop was $5,480,000, which represented approximately 14 percent of the total value of all diversified crops and livestock in the Islands. Considering the total value of diversified crops (livestock not included) in the agriculture of the Islands, coffee accounted for roughly 43 percent of the value of agricultural production. When taken on an enterprise basis, coffee exceeded any other diversified crop in value of agricultural marketings. Of the four major livestock enterprises in the Territory, three exceeded coffee in the value of their marketings. They are: Dairy—$9,067,000; Beef—$7,734,000; and Poultry—$6,468,000. Marketings of island pork totaled $3,628,000 for 1956.

In terms of acreage devoted to diversified crop production in the Territory, coffee occupied in 1956 slightly more than a third of the total land area, or 5,760 acres. While other diversified crops, with the single exception of rice, are scattered throughout the islands of the Territory, coffee acreage is concentrated largely in the Kona district on the island of Hawaii.

GROWTH PATTERN OF THE COFFEE INDUSTRY

More important perhaps than coffee's present economic position as related to other agricultural enterprises is the expansion and contraction of coffee acreage which has accompanied the booms and depressions experienced by the industry.

The first commercial efforts at growing coffee were initiated at about the same time as for sugar. Although the first recorded planting was made in 1813, it was not until the 1830's that the first large plantations were established. Until 1845 when Hawaii first started to export coffee, the crop was consumed locally or sold to whaling ships.

Various economic stimuli such as the California Gold Rush and the American Civil War brought about a competitive relationship between sugar and coffee for use of the factors of production. Coffee was unable to meet this competition because of its large labor requirement in the picking operation, and because of plant disease problems. The removal of a tariff in 1875 on coffee imported into the Islands contributed to the decline of the coffee industry which existed at that time.

Many new orchards were planted when coffee prices were high.

The next expansion of acreage occurred around the turn of the century when in 1898 there was a reported 13,947 acres in coffee. This increase in acreage was the result of an abnormally high world coffee price which was accompanied by considerable speculation on the part of investors. During the 10-year period in which the 1898 coffee boom occurred, it has been estimated that speculators lost roughly 10 million dollars in ill-advised Hawaiian coffee ventures.[1]

The second boom period for the coffee industry occurred shortly after World War II. The reaction to rising prices as evidenced by increased plantings was much less spectacular during recent good times than it was at the turn of the century. Table 1 and figure 1 below show that while the price increased as much as 165 percent, the largest acreage increase amounted to 69 percent during the period 1947 to 1956. By comparison, the acreage increase from 1893 to 1898 amounted to 830 percent. In 1893, there were 1,500 acres of coffee and by 1898 this acreage had increased to 13,947 acres.

Whether memories of the 1930's, when indebtedness on the part of farmers was of such magnitude that even the most optimistic financiers could see no hope other than foreclosure, or whether better alternative opportunities for investment presented themselves, present expansion of the industry has been less sensational than previously.

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[1] *Annual Report of Hawaii Agricultural Experiment Station*, 1901, p. 366.

TABLE 1. COFFEE: Price, acreage, and number of enterprises in the Territory, 1947 to 1956*

YEAR	PRICE†	INDEX**	ACRES	INDEX**	NUMBER OF ENTERPRISES	INDEX**
	Cents					
1947	25.3	100	3,400	100	700	100
1948	26.1	103	3,400	100	700	100
1949	26.6	105	3,400	100	703	100
1950	41.7	165	3,400	100	700	100
1951	48.8	193	3,450	101	705	101
1952	50.7	200	3,500	103	706	101
1953	53.2	210	3,750	110	712	102
1954	67.0	265	5,010	147	906	129
1955	64.5	255	5,140	151	876	125
1956	63.0	249	5,760	169	994	142

* *Statistics of Hawaiian Agriculture, 1956.*
† Green coffee, crop year ending June 30: 1947–52 prices are for prime coffee f.o.b. Kona mill; prices for 1953–56 are for weighted average of all grades.
** Index numbers based on 1947 equal 100.

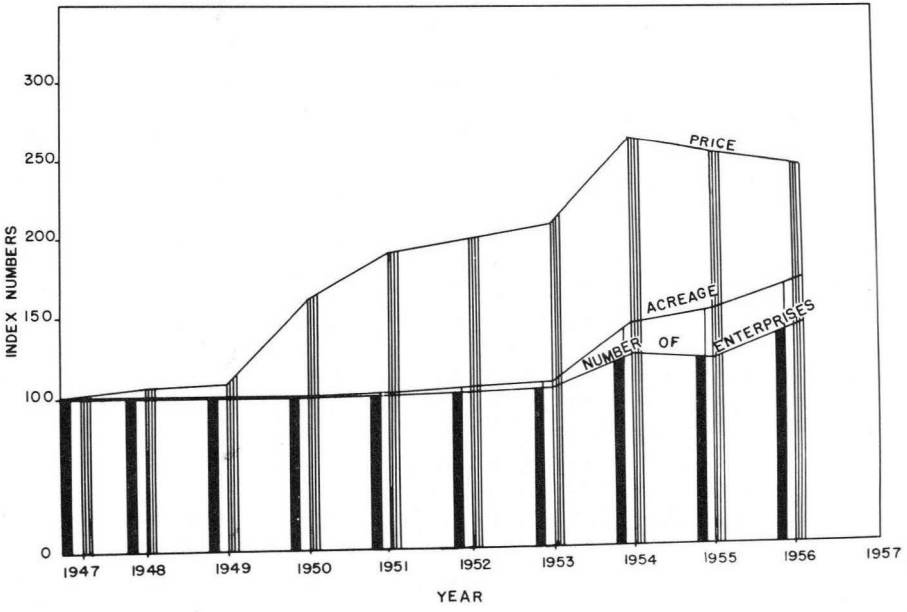

FIGURE 1. Index numbers showing changes in price, acreage, and number of enterprises by year, for coffee farms in the Territory, 1947 to 1956. Index numbers based on 1947 = 100.

Coffee farms are located on steep hillsides. The average farm is about 6 acres in size.

CHARACTERISTICS OF THE PRODUCTION UNITS

Land

The average size of coffee farms in Kona today is slightly less than 6 acres.[2] Most of the farmers in Kona lease all of their land from large ranches or estates. A few farmers own all or part of the land they farm; however, they are definitely a minority group. Many of the older leases have expired in recent years and newer ones have been instituted in their place. Also, with the expansion of coffee acreage, many leases have been negotiated on new lands. Some of these have carried important changes in leasing practice. One change has been to charge a lease fee based on the price of parchment coffee but to include a provision for a set minimum rate. One lessor, for example, bases the lease fee on the equivalent to the market value of 100 pounds of prime quality parchment coffee, or a flat $15 per acre, whichever is greater.

Labor

The typical coffee farm in Kona today is operated by family labor with the one important exception of the harvesting operation.

There are two sources of harvesting labor. If the farmer is fortunate enough to have a large number of children, then his picking problems are somewhat reduced. The importance of this labor source is recognized by the schools in Kona which arrange vacations to coincide with harvesting time. The second source of labor is hired, and includes women and children, as well as men, from plantations and towns on the island of Hawaii.

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[2] *Statistics of Hawaiian Agriculture, 1956.*

There are some hired laborers who remain in the coffee area throughout the year, but most of the hired labor required for coffee picking must come from outside the Kona area. In order to attract pickers, many Kona farmers provide housing and other goods and services such as food and transportation. Even with the inducement of housing, getting enough pickers has been an ever-increasing problem to growers.

Machinery and Equipment

By comparison with other farms in the Territory, the machinery requirements of Kona coffee farms present rather a sharp contrast. Because of the steep slopes on which most of the farms are situated, and the absence of hard surface roads, the jeep has become a necessity. Due to the presence of lithosols which are of a rocky consistency, most farms are without tillage implements and tractors. For orchard or field operations, the largest single investment in machinery is a power sprayer costing approximately $600. In some cases these sprayers are mounted on war surplus weapon carriers or pulled by jeeps. Within the confines of the typical farmstead are found the buildings and machinery commonly associated with parchment production. One such building is the pulping shed housing the machinery used in removing the fleshy part of the coffee cherry. In addition to the pulping shed, there are the racks on which the parchment coffee is dried. In recent years, mechanical driers costing roughly $2,000 have been purchased by many farmers; but the time-honored technique of sun-drying parchment still predominates in Kona. Other structures commonly found on Kona coffee farms are warehouses for storage, workmen's houses, numerous water tanks, and the family dwelling.

Miscellaneous Expenses

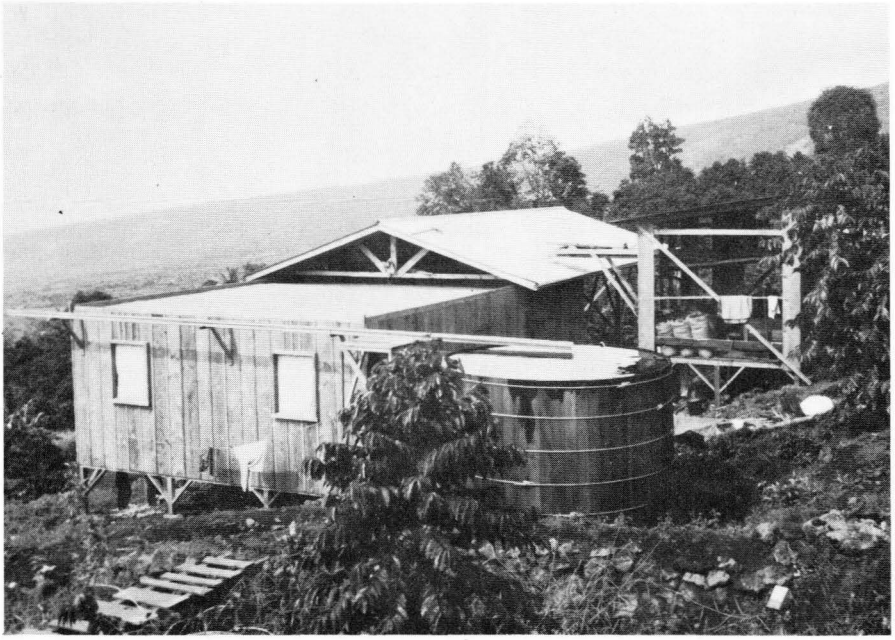
The miscellaneous expenses incurred in coffee production, with certain exceptions, are typical of those incurred in raising many other crops. Among the numerous items of supply are found fertilizer, weedicide, and gasoline. Farmers must also pay for such expenses as taxes and insurance.

Other items of expense such as picking baskets, ladders, boots, and raincoats are unique to coffee production but comprise a relatively small part of total expenses. As in most farming areas, there is considerable difference from one farm to another regarding the value of land. To some extent the value of coffee land fluctuates with the trend in coffee prices.

Women and children make up an important part of the labor supply in harvesting coffee.

Equipment normally used by pickers includes ladder, basket, raincoat, burlap bag, and hook for bending tall limbs.

Most of the parchment coffee is dried in the sun; sliding roof provides protection in case of rain.



The roofs of farm dwellings are sometimes used for drying parchment coffee. Pulping shed and water tanks adjoin farm home.

Compared with the production methods used during the 1930's there has been a sharp increase in miscellaneous expenses. During earlier times weed control was a hand operation and donkeys were a common mode of transportation. While these methods were arduous and time consuming, they did not require large cash outlays.

Marketing

There are two forms in which farmers sell their coffee—cherry and parchment. When coffee is picked off the tree, it is a small red berry and is commonly referred to as coffee cherry.

A farmer can either market his coffee as cherry, in which case he must do so shortly after picking, or he can undertake processing his crop into parchment. Processing coffee from cherry to parchment involves removing the fleshy part of the berry and drying the remaining bean and parchment covering.

Most farmers in Kona market their coffee in the form of parchment. One advantage which parchment enjoys over cherry is its storability. Once coffee is in the parchment form, it can be stored for as long as eight months without appreciable loss of quality. If coffee is stored much longer than this, the grower will be penalized price-wise when he sells it to the miller. Since the price of coffee fluctuates throughout the year, sometimes rather drastically, at times there may be something gained by being able to store coffee. However, since price fluctuations may be in either direction, an individual may lose as well as gain from storage.

Today in Kona there are 12 millers engaged in buying coffee from farmers. Most of them buy their coffee in the form of parchment, although a notable exception to this is found in one of the older mills which also buys and processes cherry. Several mills now are in the process of installing the necessary machinery for processing cherry. Among them are firms which have recently opened up new lands in Kona for coffee farming on a leasehold basis.

Once the parchment coffee is delivered to the miller, he removes the parchment husk which surrounds the bean, and separates the green coffee which remains, into different grades.

Communication is maintained between the miller and his broker who is usually located in San Francisco. The broker will generally quote a price he is willing to pay and if it is in line with what other brokers are paying, it will be accepted by the miller without further bargaining. Some coffee is shipped to Honolulu and is roasted locally and sold to consumers in the Islands. However, only a small percentage of the total crop is marketed in this manner.

CAPITAL INVESTMENT

The average investment in Kona coffee farms included in this study was $17,056. This does not necessarily mean that each farmer has this amount invested, but rather, it reflects the market value of the land, buildings, and machinery, plus other improvements on the farm.

By far the largest capital investment is in land and trees, which accounts for 84 percent of the total amount. On an acre basis, farm land with mature trees included in this study was worth an average of $2,267. Most farmers in Kona lease their land, but if they were to purchase it outright the cost would approach the above figure.

Since most farmers lease their land, the buildings in Kona are built and maintained with utility in mind. Even in the case of the farm home which is excluded from computations showing capital investment, the emphasis is on providing only the essentials for comfort and health. Most of the buildings in Kona are left unpainted and receive the minimum in the way of maintenance costs. In spite of the rough exterior presented by these farm buildings, many of them are ruggedly built with cement foundations and galvanized iron roofs.

Oftentimes growers make their buildings serve a dual purpose. Many of the drying racks are not separate structures but are built on the roofs of workmen's quarters, storage sheds, or even farm homes.

The amount of machinery used on Kona farms has increased steadily since World War II and there is evidence to indicate that this trend will continue. An inventory of most farms would reveal the presence of a power sprayer and a jeep. In addition to this, many farms also have a four-wheel-drive truck and a number have mechanical driers. Processing equipment such as pulpers, elevators, and fermentation tanks represents a large part of the total investment in machinery.

Besides the investment in land, buildings, and machinery, there are other investments which do not fit conveniently into these categories. Such items as roads, stone walls, and ditches often represent a considerable cost to growers and land owners. In the case of lease land the responsibility to provide the above structures generally rests with the lessee. While the investment in these items is nominal compared to the total investment required, it amounted to $299 per farm.

Table 2 shows the capital investment required per acre for each of the major categories of investment. It shows the capital outlay necessary if an investor were to purchase a farm outright in fee.[3]

TABLE 2. Capital investments per acre for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	LAND	BUILDINGS*	MACHINERY	OTHER	TOTAL
			Dollars			*Dollars*
1	4.50	2,500	300	243	111	3,154
2	5.00	2,500	165	130	50	2,845
3	6.20	2,000	257	236	40	2,533
4	5.00	2,500	230	88	40	2,858
5	1.00	3,000	600	400	—	4,000
6	8.00	2,500	181	97	19	2,797
7	4.50	1,000	256	130	83	1,469
8	8.50	2,500	162	67	38	2,767
9	2.75	3,500	146	115	55	3,816
10	6.00	2,000	188	117	33	2,338
11	9.29	3,000	369	138	94	3,601
12	8.00	2,000	256	123	63	2,442
13	4.00	2,000	262	319	53	2,634
14	5.25	2,000	203	203	48	2,454
15	17.16	2,000	143	173	14	2,330
All farms		2,267	221	153	47	2,688
Average per farm	6.3	14,381	1,404	972	299	17,056

* Does not include family dwelling.

[3] To have full ownership.

COSTS AND RETURNS

Cash Costs and Returns

There are many different ways of arriving at the total cost of producing a pound of coffee. In their calculations farmers are likely to consider only the actual out-of-pocket expenses which they incurred during the production year. When cost of production and net returns are calculated using only out-of-pocket costs, two very important items are overlooked. These are: (1) capital costs, including depreciation and interest on buildings and farm machinery; and (2) the value of family labor. For farmers who own their farms free and clear, land charges also are omitted. Calculations based on out-of-pocket costs are of little value for use in farm planning where any degree of projection is involved; however, they do give some measure of the socio-economic welfare of the farm family in any one year. This method of computation avoids having to place a valuation on family labor, buildings, and machinery. It avoids having to set up a depreciation schedule on capital items, or assessing interest charges on such investments. Further, it is relatively easy to calculate and is readily understood by growers.

The main disadvantage of the out-of-pocket method of evaluation is that it often creates an erroneous impression as to the welfare of coffee growers. It should be borne in mind that long-run costs will be very much higher than those arrived at by deducting only cash expenses. Sometime during any long-run period buildings and machinery must be replaced, and interest must be provided for loans or investments.

Table 3 shows the costs and returns per acre derived from coffee production for the crop year 1955–56 when cash costs only were considered in the computations.[4]

TABLE 3. Cash costs (out-of-pocket costs) and returns per acre for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	CASH COSTS				RETURNS	
		Land	Hired labor	Miscellaneous expenses	Total	Gross	Net
		Dollars			*Dollars*	*Dollars*	
1	4.50	10	—	220	230	938	708
2	5.00	—	385	233	618	1,255	637
3	6.20	25	488	400	913	2,280	1,367
4	5.00	20	116	255	391	1,481	1,090
5	1.00	125	326	501	952	2,000	1,048
6	8.00	—	40	173	213	1,071	858
7	4.50	3	45	103	151	356	205
8	8.50	47	138	143	328	905	577
9	2.75	40	—	181	221	1,484	1,263
10	6.00	18	633	388	1,039	1,463	424
11	9.29	25	398	354	777	1,402	625
12	8.00	24	422	379	825	1,402	577
13	4.00	10	219	210	439	1,196	757
14	5.25	31	396	407	834	2,026	1,192
15	17.16	20	240	191	451	1,135	684
All farms		21	268	261	550	1,302	752
Percent of total cash cost		4	49	47	100		

[4] For tables showing the same relationships on a per farm and per pound of parchment basis, refer to appendix tables A–1 and A–2.

TABLE 3-A. Cash costs (out-of-pocket costs) and returns per acre for highest and lowest net income farms

RANK	ACRES PER FARM	CASH COSTS				RETURNS	
		Land	Hired labor	Other	Total	Gross	Net
		Dollars			*Dollars*	*Dollars*	
Low	4.50	3	45	103	151	356	205
High	6.20	25	488	400	913	2,280	1,367

The average net return per acre, when only cash costs were considered, was $752. The largest net return per acre was achieved by a farmer who had an exceptionally high yield coupled with a higher than average price per pound. His net return was $1,368 per acre. The lowest net return per acre was $205 and was primarily the result of a low gross return rather than a high production cost.

Total Costs and Returns

Total cost, as the name implies, means that every cost item incurred has been computed in arriving at the final cost of producing coffee. Such a computation of

TABLE 4. Total costs and returns per acre for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	TOTAL COSTS							RETURNS	
		Land	Hired labor	Family labor*	Interest	Depreciation	Miscellaneous expenses	Total	Gross	Net
		Dollars						*Dollars*	*Dollars*	
1	4.50	38	—	369	33	117	220	777	938	161
2	5.00	20	385	366	17	89	233	1,110	1,255	145
3	6.20	80	488	376	27	99	400	1,470	2,280	810
4	5.00	20	116	498	18	71	255	978	1,481	503
5	1.00	125	326	780	50	284	501	2,066	2,000	— 66
6	8.00	50	40	413	15	61	173	752	1,071	319
7	4.50	25	46	89	23	84	103	370	356	— 14
8†	8.50	47	138	227	13	57	143	625	905	280
9	2.75	40	—	1,238	16	45	181	1,520	1,484	— 36
10	6.00	18	634	158	17	92	388	1,307	1,463	156
11	9.29	40	398	139	30	172	354	1,133	1,402	269
12	8.00	24	421	128	22	87	379	1,061	1,402	341
13	4.00	10	219	481	32	79	210	1,031	1,196	165
14	5.25	31	396	504	23	71	408	1,433	2,026	593
15	17.16	20	240	164	17	99	191	731	1,135	404
All farms		34	268	302	21	94	261	981	1,302	321
Percent of total cost		3	27	31	2	10	27	100		

* Family labor calculated at same rate as the average amount paid hired labor ($.73 per hour).
† On farm No. 8, both cherry and parchment were sold. Labor and gross return were calculated as though only parchment were sold for comparison with other farms.

TABLE 4-A. Total costs and returns per acre for highest and lowest net income farms

RANK	ACRES PER FARM	TOTAL COSTS							RETURNS	
		Land	Hired labor	Family labor	Interest	Depreciation	Other	Total	Gross	Net
		Dollars						*Dollars*	*Dollars*	
Low	1.00	125	326	780	50	284	501	2,066	2,000	− 66
High	6.20	80	488	376	27	99	400	1,470	2,280	810

cost differs very markedly from cash costs as shown in table 3. Total cost includes many cost items not included in figuring cash cost, such as depreciation, interest on investment, and a charge for family labor. It does necessitate, however, a certain amount of subjective judgment in placing values on land, buildings, machinery, and family labor.

The first cost shown in the third column of table 4 is that of land. While some coffee farmers own all or part of the acreage they farm, a charge was made in either case. In situations where the land was owned outright, the cost of land was calculated by asking the farmer concerned what he could lease his land for should he choose to do so. In turn this figure was compared to that charged farmers on nearby property where similar conditions existed. The principle behind a charge of this kind is that farmers who own land have the opportunity of leasing it to others and thus earn a return on their investment. By choosing to utilize the land himself, he must regain its lease value after all other costs are paid; otherwise it would pay him to lease.

The next cost item is hired labor which is shown in column 4. This charge was taken directly from farm records and represents the amount each farmer actually paid out for hired labor. While hired labor in Kona is paid on a piece work basis, the average cost per hour was computed by dividing the total wages paid by total hours worked. As can be seen from table 4, hired labor constitutes a very important part of total cost averaging slightly over 27 percent. Since this represents a cost which comes directly out of the farmer's pocket each year, it is his most important single cost item.

Another cost item of considerable importance is family labor. Many farmers do not consider family labor in calculating their production cost simply because it is not actually paid by them. However, family labor is a resource from which a return could be earned if it were employed off the home farm. In Kona where hired labor is scarce, opportunities for employment off the home farm are very good. Column 5 of table 4 shows the charge made each farm for family labor. It was calculated by multiplying the hours of family labor by 73 cents per hour which is the average rate paid hired labor. Undoubtedly, the time expended by the operator of a coffee farm is worth considerably more than 73 cents per hour, but his time is not all chargeable to labor per se, but also to his value as a manager. The wages of management are reflected in the net returns earned per acre after the manager's labor value of 73 cents per hour is deducted. Another reason for pricing family labor at the hired labor rate is that it allows the direct comparison of farms using only family labor with those using mostly hired.

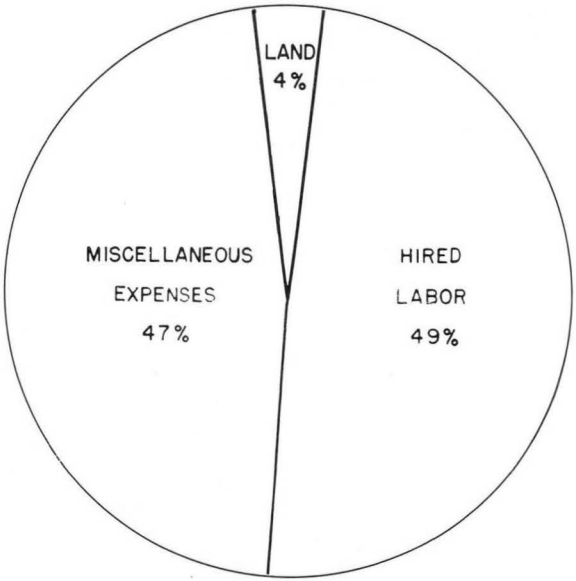


FIGURE 2. Distribution of cash or out-of-pocket costs for the average of selected farms in the Kona district, 1955–56 crop year.

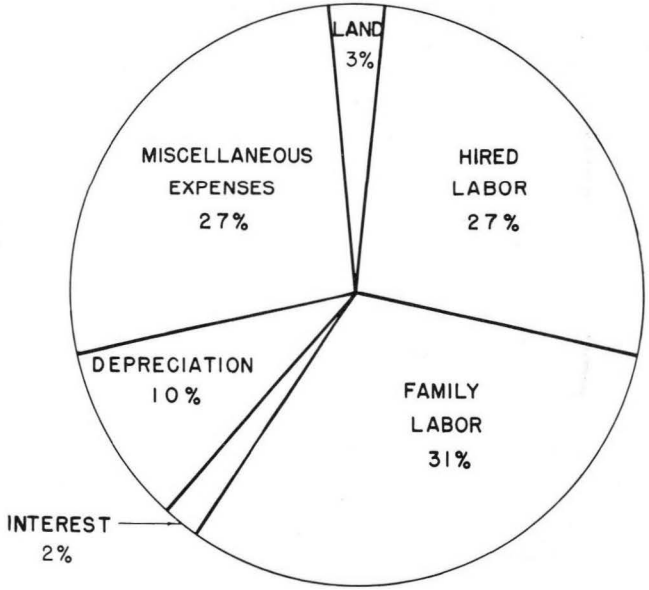


FIGURE 3. Distribution of total costs for the average of selected farms in the Kona district, 1955–56 crop year.

In order to calculate the charges for interest and depreciation, it was necessary first to determine the value of each farm building and piece of equipment. This was done by asking each farmer in the study to appraise the value of his buildings and equipment. In arriving at the market value which we sought, it was explained to each farmer that we wanted to know how much extra he would be willing to pay for land possessing similar buildings as compared to land having no buildings at all. Thus the value which each farmer placed on his buildings does not represent replacement cost but as near as possible represents actual market value. In the case of equipment such as power sprayers, trucks, and jeeps, farmers were asked what such equipment could be sold for in its present condition. The farm operator was then asked to estimate the probable length of life which his buildings and machinery still possessed.

Appraising the value of each building and piece of machinery on a market value basis and estimating its probable life involve a great deal of judgment on the part of the farmer. It is felt, however, that this method is more realistic than an appraisal based on replacement value. Even though a number of farmers were involved in making appraisals of this kind, a very close similarity existed in appraisals involving buildings of similar kind, size, and purpose.

Interest charges were computed by using the average value method. The interest charge in each case was a flat 5 percent. The depreciation charge was computed by dividing the farmer's estimated value of his buildings and equipment by the remaining useful life which he indicated.

No depreciation was computed on the orchard itself. For one thing no one was able to give a realistic length of life over which a coffee orchard might be expected to last. There are coffee orchards in Kona today which are 50 to 60 years old and are still in their prime. Another reason why a depreciation charge was not made on the orchard was that there is a constant replacement of trees made each year. In making these replacements, the material and labor involved would be charged to the current year's expenses and labor hours. By replacing trees which are damaged by insects or other hazards, it is possible to assume that eventually, if given enough time, the entire orchard would be replaced. At the current rate of replacement going on in most orchards today, the time required to completely replace an orchard would extend well beyond the lifetime of the average farmer.

As can be seen from table 4 which shows the cost of producing coffee on a total cost basis, interest and depreciation together make up approximately 12 percent of the total cost of production. The next item of cost after interest and depreciation is the grouping of miscellaneous expenses shown in column 8. Miscellaneous expenses are taken directly from farm records and represent a direct cash outlay to the farmer. The average amount paid out by farmers for miscellaneous expenses came to $261 and represents 27 percent of the total cost of production.

The average cost of production for farms in this study was $981 per acre. The average net return per acre was $321. Three farms in the study showed negative net returns, which means that the operator and his family earned less than the average of 73 cents per hour paid to hired labor.

The farm showing the lowest net return was farm number 5 with a negative net return of $66. Although farm number 5 had a much higher gross return per acre than the average farm in this study, it was not high enough to compensate for the very high cost of production. Since the size of this farm is only one acre, a person

would normally expect many costs to be high because of the difficulty in spreading overhead costs. In fact, the costs incurred on this farm are over double those incurred on the average farm in the study.

Farm number 3 with a net return per acre of $811 had the highest net return of any farm in the study. The acreage on this farm approximates the average size farm in Kona, but it differs from other coffee farms in this study in most other respects. The cost of production on farm number 3 was approximately 50 percent higher than that experienced on the average of farms in this study, but the gross returns from this farm were 75 percent greater than the above average. The high gross returns achieved on this farm were primarily due to a very high per acre yield combined with a somewhat higher price received per pound of parchment sold.

Returns to Family Labor

To the urban worker one of the most important measures of his wage is how much he makes per hour. Rarely, if ever, do farmers measure their earnings in these terms. Farmers are more apt to consider their earnings on a yearly basis, and in Kona, even picking labor is paid on a piece work basis.

Table 5 shows the return per hour of family labor when all of the net return is considered due to the family part of the labor factor. It is computed by dividing the net return per farm by the number of hours of family labor. The cost of production

TABLE 5. Returns to family labor for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	PER ACRE								Family labor hours	NET PER HOUR OF FAMILY LABOR
		Costs						Returns			
		Land	Hired labor	Interest	Depreciation	Miscellaneous expenses	Total	Gross	Net to family labor		
		Dollars					*Dollars*	*Dollars*			*Dollars*
1	4.50	38	—	33	117	220	408	938	530	506	1.05
2	5.00	20	385	17	89	233	744	1,255	511	501	1.02
3	6.20	80	488	27	99	400	1,094	2,280	1,186	514	2.31
4	5.00	20	116	18	71	255	480	1,481	1,001	681	1.47
5	1.00	125	326	50	284	501	1,286	2,000	714	1,068	0.67
6	8.00	50	40	15	61	173	339	1,071	732	566	1.29
7	4.50	25	46	23	84	103	281	356	75	121	0.62
8*	8.50	47	138	13	57	143	398	905	507	311	1.63
9	2.75	40	—	16	45	181	282	1,484	1,202	1,696	0.71
10	6.00	18	634	17	92	388	1,149	1,463	314	216	1.45
11	9.29	40	398	30	172	354	994	1,402	408	191	2.14
12	8.00	24	421	22	87	379	933	1,402	469	175	2.67
13	4.00	10	219	32	79	210	550	1,196	646	659	0.98
14	5.25	31	396	23	71	408	929	2,026	1,097	691	1.59
15	17.16	20	240	17	99	191	567	1,135	568	225	2.52
All farms		34	268	21	94	261	678	1,302	624	414	1.51

* On farm No. 8, both cherry and parchment were sold. Labor and gross return were calculated as though only parchment were sold for comparison with other farms.

TABLE 5-A. Returns to family labor for highest and lowest net income farms

RANK	ACRES PER FARM	PER ACRE									NET PER HOUR OF FAMILY LABOR
		Costs						Returns		Family labor hours	
		Land	Hired labor	Interest	Depreciation	Miscellaneous expenses	Total	Gross	Net to family labor		
		Dollars					*Dollars*	*Dollars*			*Dollars*
Low	4.50	25	46	23	84	103	281	356	75	121	0.62
High	8.00	24	421	22	87	379	933	1,402	469	175	2.67

figures are the same as those shown in table 4 except that family labor is not included in arriving at the total cost of production.

COST AND USE OF LABOR

Cost of Hired Labor

Labor hired for picking coffee in Kona is paid on a piece work basis or so much per bag of cherry coffee picked. In order to determine the rate per hour paid, the total wages received by hired labor was divided by the number of hours which they worked. The cost per hour and cost per acre as well as per farm are shown in table 6.

TABLE 6. Cost and hours of hired labor per farm and per acre for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	COST		HOURS WORKED		COST PER HOUR
	Farm	Per acre	Farm	Per acre	
	Dollars				*Dollars*
1	—	—	—	—	—
2	1,924.18	384.84	1,695.50	339.10	1.13
3	3,025.75	488.02	4,819.00	777.26	0.63
4	581.00	116.20	1,252.00	250.40	0.46
5	326.25	326.25	456.00	456.00	0.72
6	324.00	40.50	199.00	24.88	1.63
7	205.00	45.56	360.00	80.00	0.57
8	1,175.00	138.24	725.00	85.29	1.62
9	—	—	—	—	—
10	3,802.01	633.67	3,742.00	623.67	1.02
11	3,697.25	397.98	6,225.00	670.08	0.59
12	3,370.72	421.34	3,469.00	433.62	0.97
13	875.00	218.75	1,683.50	420.88	0.52
14	2,078.78	395.96	1,529.50	291.33	1.36
15	4,120.90	240.15	8,788.00	512.12	0.47
Total	25,505.84		34,943.50		
Average	1,700.39	268.06	2,329.57	367.25	0.73

Fifty-gallon drums with sheet iron, placed at intervals throughout orchard, provide water and mixing tank for spraying weeds.

County Agent Iwane is shown mixing weedicide. Pump in picture is generally jeep mounted, making it easier to move from one drum to another.

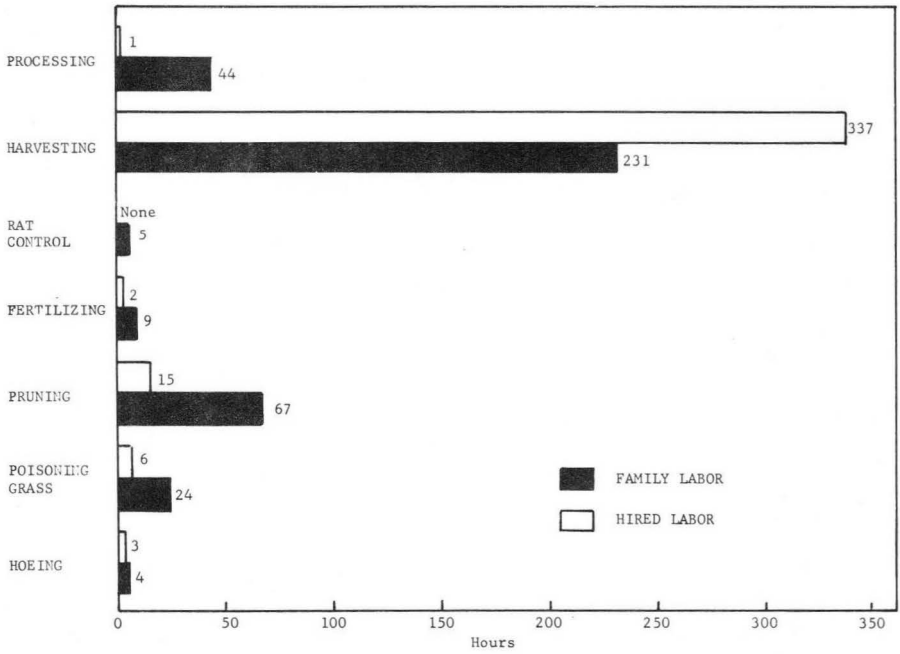


FIGURE 4. Man-hour requirements per acre for hired and family labor, by job.

Jobs Done by Hired Labor

Hired labor on Kona coffee farms is used almost exclusively for picking coffee. Farm operators in some cases attempt to provide their pickers with off-season jobs as a fill-in so that they will be available when the harvesting season begins. As can be seen from table 7, the amount of hired labor used for jobs other than harvesting makes up 8 percent of the total.

There is a great deal of difference from one farm to another with respect to the amount of hired labor used. There are several factors which influence this but most important is the size of the operator's family. Another factor of importance is the number of acres which the operator is farming.

In recent years the demand for hired labor has increased. To some extent this is due to the fact that Kona farmers of today have smaller families than previously. While improved farming methods such as chemical weed control, which uses very little hired labor, have reduced the time required for this operation, virtually nothing has been done to lower the major hired labor input, which is picking.

Considering all of the farms in this study, 47 percent of all labor was hired. If we exclude family farms where no hired labor was used, then hired labor would amount to 52 percent of the total labor input.

TABLE 7. Distribution of hired labor time per farm, by job, for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	HOEING	POISONING GRASS	PRUNING	FERTILIZING	HARVESTING	PROCESSING	OTHER JOBS	TOTAL	HIRED LABOR AS A PERCENT OF TOTAL LABOR
					Hours				*Hours*	*Percent*
1	4.50	—	—	—	—	—	—	—	—	—
2	5.00	16	66	120	6	1,379	—	108	1,695	40
3	6.20	25	—	—	—	4,794	—	—	4,819	60
4	5.00	—	—	—	—	1,252	—	—	1,252	27
5	1.00	—	—	—	—	456	—	—	456	30
6	8.00	—	—	—	—	199	—	—	199	4
7	4.50	—	—	—	—	240	—	—	240	26
8	8.50	—	—	—	—	725	—	—	725	22
9	2.75	—	—	—	—	—	—	—	—	—
10	6.00	—	288	234	17	3,203	—	—	3,742	74
11	9.29	296	77	728	75	4,969	—	80	6,225	78
12	8.00	—	96	336	84	2,945	—	8	3,469	71
13	4.00	—	—	—	—	1,684	—	—	1,684	39
14	5.25	—	—	24	48	1,404	54	—	1,530	30
15	17.16	—	—	—	—	8,788	—	—	8,788	70
Per acre all farms		3	6	15	2	337	1	2	366	
Percent of total hired labor hours		1	1	4	1	92	*	1	100	
Percent of total labor hours†		*	2	2	*	43	*	*	47	

* Less than .5 percent.
† Total labor includes hired and family labor.

Total Labor Requirement by Job

In terms of both hired and family labor it required 782 man-hours per acre to accomplish all of the various jobs necessary to coffee production. By far the greatest amount of labor is devoted to the harvesting operation which accounts for 73 percent of the total labor input.

Most of the labor required for jobs other than harvesting is done with family labor, but even in the case of family labor the largest single use is for harvesting.

The total labor input, both hired and family, is shown in table 8.

TABLE 8. Distribution of total labor per acre, by job, for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	HOEING	POISONING GRASS	PRUNING	FERTILIZING	RAT CONTROL	HARVESTING	PROCESSING	OTHER JOBS	TOTAL
					Hours					*Hours*
1	4.50	—	11	25	11	2	421	13	23	506
2	5.00	4	43	56	4	6	285	218	224	840
3	6.20	8	9	73	19	3	1,090	45	45	1,292
4	5.00	—	19	74	9	—	775	25	30	932
5	1.00	—	10	75	12	5	1,364	30	28	1,524
6	8.00	28	63	48	24	*	401	15	12	591
7	4.50	—	7	15	9	2	133	14	21	201
8	8.50	1	29	38	4	12	270	36	6	396
9	2.75	—	22	155	22	4	1,397	23	73	1,696
10	6.00	—	97	70	12	1	592	38	30	840
11	9.29	33	19	95	10	8	609	54	33	861
12	8.00	—	24	111	13	1	408	38	14	609
13	4.00	—	45	36	12	1	921	52	13	1,080
14	5.25	5	77	296	16	42	430	91	25	982
15	17.16	—	4	83	5	1	602	24	18	737
All farms		7	30	82	11	5	568	45	34	782
Percent of total labor hours		1	4	10	1	1	73	6	4	100

* Less than one hour.

MISCELLANEOUS EXPENSES

As the name implies, miscellaneous expenses include a variety of costs for which the farmer generally pays cash. In some cases farmers are allowed short-term credit for cost items such as weedicide and fertilizer, but normally settle such accounts when their crop is marketed.

The average of all farms in this study showed that miscellaneous expenses totaled $261 per acre, and that the largest single expense item was fertilizer which cost farmers $93 per acre, or 35 percent of their total miscellaneous expense. A breakdown based on the kind of fertilizer used and the amount is shown further on in the text in table 10.

The third column of table 9 has as a heading the word "supplies." This term refers to expenses not directly chargeable to the other expenses mentioned and includes such items as picking baskets, boots, raincoats, twine, and similar items of supply.

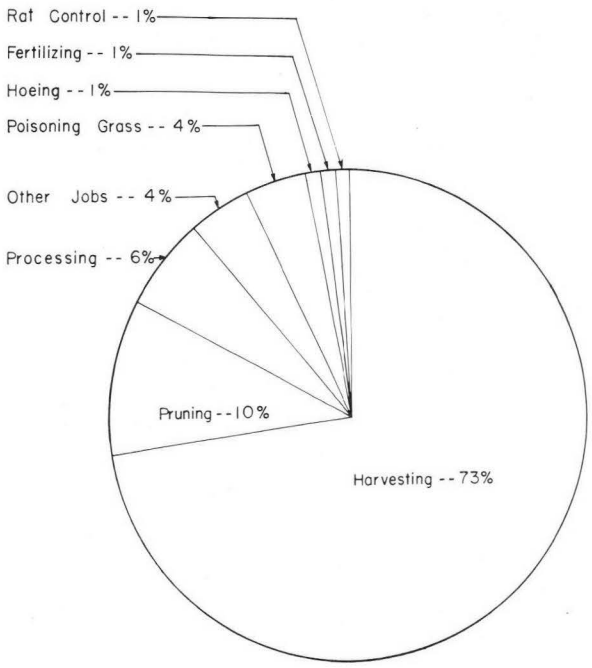


FIGURE 5. Distribution of total labor hours per acre, by job, for the average of selected farms in the Kona district, 1955–56 crop year.

Mechanization on coffee farms is largely responsible for two relatively important expenses. They are: (1) repairs and maintenance, and (2) gas and other fuel. When these two expense items are combined they account for 28 percent of total expenses and cost farmers an average amount of $73 per acre.

Taxes comprise a rather important expense item. For every acre operated farmers in this study paid an average amount of $27 per acre in taxes. There are a number of taxes which farmers pay but in most instances the gross income tax[5] made up the bulk of this burden. Personal net income tax was not included in this study because it is based on many factors outside of the business aspects of farming. Other taxes of importance are property taxes and taxes on motor vehicles.

The insurance cost reported here is based on what farmers actually paid. Somewhat like taxes, insurance costs come from many sources. Among the more important sources are insurance relating to labor, buildings, and motor vehicles.

While the cost of weedicide in itself is a relatively small cost compared to other expense items, the total cost of weed control is high. This is because the weed control operation absorbs considerable amounts of labor and requires the use of

[5] In 1956 farmers were required to pay a territorial tax on their gross incomes of 1½ percent.

Pruning coffee trees requires skill and judgment.

Weed spraying, though easier than hoeing, still requires hard physical labor.

machinery. At the time of this study it was still legal to use arsenic type weed killers which did a very effective job of control. Since 1956 arsenic type sprays have been outlawed, thus forcing farmers to rely on more expensive weedicides which require more frequent applications.

Table 9 shows the relative importance of the different items of expense as well as total miscellaneous expenses per acre.

TABLE 9. Distribution of miscellaneous expenses per acre for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	MISCELLANEOUS EXPENSES									
		Supplies	Repairs, maintenance	Fertilizer	Gas, other fuel	Taxes	Insurance	Water, electricity, telephone	Freight, trucking	Weedicide	Total
						Dollars					*Dollars*
1	4.50	6	37	76	26	33	11	6	—	25	220
2	5.00	11	29	88	33	28	13	4	9	18	233
3	6.20	9	49	118	29	40	32	5	113	5	400
4	5.00	3	65	101	26	25	7	5	9	14	255
5	1.00	3	12	72	286	69	41	18	—	—	501
6	8.00	1	—	100	20	25	9	4	—	13	172
7	4.50	5	25	39	11	6	7	4	—	6	103
8	8.50	11	18	65	1	20	9	3	—	16	143
9	2.75	—	8	79	20	29	—	5	8	32	181
10	6.00	20	25	123	63	30	46	4	57	19	387
11	9.29	6	94	116	55	29	17	11	10	16	354
12	8.00	38	51	136	82	29	18	3	12	11	380
13	4.00	11	20	103	5	30	16	3	3	19	210
14	5.25	71	61	126	54	44	18	6	14	14	408
15	17.16	33	32	58	19	22	11	6	4	6	191
All farms		18	38	93	35	27	16	5	16	13	261
Percent of total		7	15	35	13	11	6	2	6	5	100

Many farmers improvise their own spraying equipment. Portable sprayers vary in capacity from 200 to 600 gallons and can keep two or more men busy spraying.

Stationary tanks with pipe lines running through orchard are expensive to install but save considerable labor.

FERTILIZER

Because of the importance of fertilizer as a determinant of crop yield, table 10 was composed to show fertilizer input in more detail.

TABLE 10. Fertilizer inputs and cost per acre for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	TYPE OF FERTILIZER								TOTAL COST PER ACRE ALL FERTILIZERS
		6–10–20		10–5–20		20–0–0		Lime		
		Amount applied	Total cost	Amount applied	Total cost	Amount applied	Total cost	Amount applied	Total cost	
		Pounds	*Dollars*	*Pounds*	*Dollars*	*Pounds*	*Dollars*	*Pounds*	*Dollars*	*Dollars*
1	4.50			1,622	76					76
2	5.00			1,700	86	40	2			88
3	6.20			2,339	118					118
4	5.00			2,160	101					101
5	1.00			1,600	72					72
6	8.00			2,138	100					100
7	4.50			778	39					39
8	8.50	471	31	536	35					66
9	2.75			2,182	79					79
10	6.00			2,667	104	500	20			124
11	9.29			1,722	90	484	25			115
12	8.00			2,000	118	312	18			136
13	4.00			1,600	85			1,000	19	104
14	5.25			2,000	74			1,390	52	126
15	17.16			816	45	233	13			58
All farms										93

YIELD, PRICE, AND RETURN

Table 11 gives a breakdown of the yield of parchment, the price received, and the gross return per acre by farm. Yield in terms of parchment was determined by adding the amount of coffee in storage to the amount of coffee sold, being careful in the case of storage stocks to record only that produced during the 1955–56 crop year. The unit price was then established for the amount of parchment sold and applied to the total yield.

While some farmers stored a considerable amount of their crop, the amount sold shortly after processing generally was greater. Some farmers are limited in the amount of coffee they can store, because of the limitation on available space. In other cases farmers must sell their coffee in order to meet production costs or other accounts.

As can be seen from table 11 the price per pound paid by millers for coffee differed among growers. To a large extent this is a reflection of the time of year each grower marketed the major portion of his crop. Prices paid for parchment by millers fluctuate, sometimes considerably, during the crop season. Another factor giving rise to a difference in prices paid to growers is the quality difference in their crops. The average unit price received, considering all farms in this study, was 48 cents.

TABLE 11. Yield, price, and gross return per acre for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	PARCHMENT YIELD	PARCHMENT PRICE PER POUND	GROSS RETURN
		Pounds	*Dollars*	*Dollars*
1	4.50	1,860	.505	939
2	5.00	2,697	.465	1,254
3	6.20	4,499	.507	2,281
4	5.00	2,988	.496	1,482
5	1.00	4,000	.500	2,000
6	8.00	2,336	.459	1,072
7	4.50	778	.458	356
8	8.50	1,832	.494	905
9	2.75	3,157	.470	1,484
10	6.00	3,068	.477	1,463
11	9.29	2,819	.497	1,401
12	8.00	3,022	.464	1,402
13	4.00	2,482	.482	1,196
14	5.25	3,814	.531	2,025
15	17.16	2,449	.463	1,134
All farms		2,689	.484	1,302

FACTORS AFFECTING COST AND RETURNS

Hawaii's Competitive Position: Quality

Kona coffee has earned a reputation among coffee buyers as a high quality, mild coffee, and it therefore enjoys a slight price advantage over most other coffees produced elsewhere in the world. In recent years this advantage has been threatened by both external and internal factors. Among the external factors are the rapid development and use of soluble coffees[6] and the increased plantings of higher quality coffees throughout the world. How far and in which direction these developments will go is beyond the control of Kona farmers.

Internal factors which affect Kona's economic position in the market are for the most part controllable. The quality of Kona coffee over the years has been declining. Informed scientists attribute this decline in quality almost entirely to the way in which coffee is processed. There is also other evidence which tends to support this view. For one thing processing occurs at harvesting time when the individual farmer can least afford to devote his labor to it.

Considerable interest has been expressed recently by millers and others in the idea of centralized processing. One of the older and larger firms in Kona has been processing coffee for a number of years. The proponents of this idea list several advantages of the method. Among them are: (1) it would improve the quality of Kona coffee which has been declining in recent years, and (2) it would be accomplished more cheaply by large mass production methods.

[6] Soluble coffees are commonly referred to as instant coffees and are made from cheaper low grade coffees.

From the standpoint of the individual farmer, considerable family labor might be utilized for harvesting were it not devoted to the processing operation. Doing away with processing on the farm would be one means of saving labor, which might allow some farmers to increase their coffee acreage and at the same time make more efficient use of their family labor.

Hawaii's Competitive Position: Cost

From the standpoint of production cost, Hawaii enjoys a limited number of advantages over other coffee-producing countries. Recent cost of production information from Latin America[7] provides a basis for comparing Kona with the major coffee-producing countries of the world. By comparison with Hawaii the cost of production on an area basis in Latin America is very low. However, when a comparison is made based on the cost per pound of coffee produced, a much closer similarity exists between Latin America and Hawaii. One of the main advantages which Hawaii has over other areas is a very high yield per acre. These abundant yields make it possible to spread the high per acre costs of land and labor over a large number of pounds. They also make it possible for farmers to achieve a high degree of intensity on a very small acreage. Not only is it necessary for Kona farmers to keep their cost down per pound of coffee produced, but they must also produce enough coffee to provide for a sufficient volume of business per farm unit.

Figure 6 shows the relationship between yield and total cost of production on a per acre basis. Total cost for each farm is taken from table 4 of the text and yield is taken from table 11. The line in this graph (fig. 6) represents the average of farms in this study and shows that as the cost of production per acre increases so does the yield in pounds of parchment. The important question to farmers is, "How many pounds of parchment coffee were obtained for each dollar expended?" When the price of parchment is known the answer to this question shows the efficiency of the farm and establishes the break-even point in cents per pound for a given level of production. The line shown in figure 6 was derived by taking a weighted average of the farms in this study based on the number of acres in each farm. The weighted average of the yields of these farms was 2,689 pounds of parchment per acre, and the cost of production $981 per acre. The intersection of these two quantities is shown on the graph at point "A." Thus on the average farm approximately 2¾ pounds of parchment were obtained for each dollar it cost to produce it. To recover this cost it would be necessary to sell the 2¾ pounds of parchment for 36 cents per pound. In order to show the relationship of each farm in the study to the average of all farms, lines were extended from point "A" toward the origin and away from it, thus maintaining the average relationship of yield to cost of 2¾ to 1. All farms which fall above the line received more than 2¾ pounds of parchment for each dollar expended, while those falling below received less than this amount.

To compare the relative efficiency of one farm to another a straight line can be drawn from the point of origin to each farm in question. When the slopes of the lines are compared, the farm with the steepest slope will be the one having the lowest cost per pound of coffee produced.

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[7] This information provided by Mr. Y. Baron Goto in his trip report on Latin American visit made in 1957.

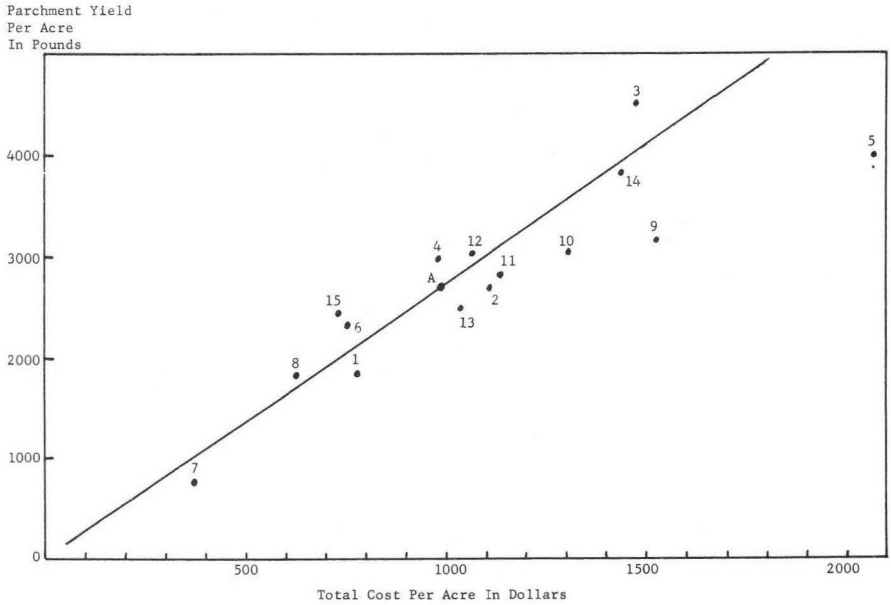

FIGURE 6. The relationship between total cost or production per acre and parchment yield per acre, selected farms in Kona district, 1955–56 crop year.

Farms having the greatest efficiency in terms of cost per pound of coffee produced do not necessarily yield the greatest net returns per acre. This is because net return per acre is arrived at by multiplying quantity produced by the profit made on each pound. Thus farm number 3 and farm number 4 have the same cost of production per farm but farm number 3 has a much higher net return per acre because it produced a larger number of pounds.

As successive applications of materials and labor are applied to a given quantity of land, eventually the response of yield will decline in accordance with the law of diminishing returns. Farms 9 and 5 in figure 6 would tend to indicate that a curve might fit the data and that diminishing returns had set in where these farms are plotted. Farms 9 and 5 are both less than 3 acres in size, however, and their high cost of production per pound is due primarily to their low scale of operation.

On small farms which depend almost entirely on family labor the operator may be justified in increasing his labor input to a point where his total cost, which includes family labor, exceeds the price of parchment. Whenever the cost of production is expressed on a total cost basis as it is in figure 6, a farmer whose cost exceeds the price of parchment is receiving less than 73 cents per hour for his labor. But, by putting in a large number of hours he may add to gross family income even though his return may be less than 73 cents per hour.

Effect of Scale of Operation

There are two major advantages which large farms usually have over small farms:

1. Large farms produce enough coffee to provide a sufficient total family income.

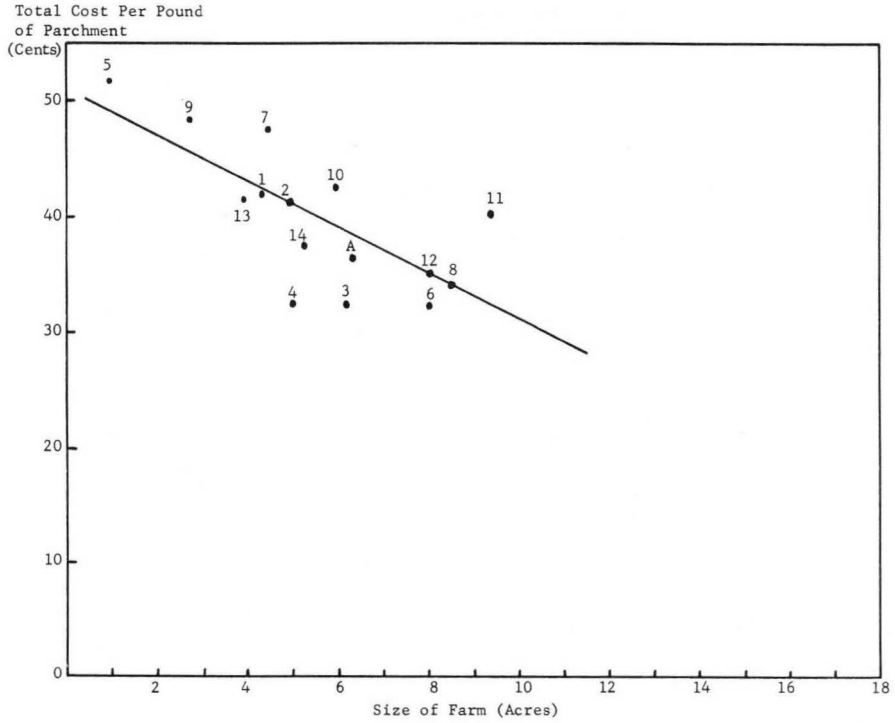

FIGURE 7. Cost of production per pound of parchment as related to farm size, selected farms in the Kona district, 1955–56 crop year.

2. Large farms in general are more efficient; therefore, cost of production per pound is lower.

Figure 7 shows the relationship between the cost of production per pound of parchment and the size of farm in acres. The line drawn through the data in figure 7 is a simple average of all the farms shown except farm No. 15. Since farm No. 15 is much larger than the other farms in this study, the slope of the line between it and the other farms cannot be determined.

It is evident from this figure that as the size of the individual farm increases there is a tendency for the cost of production per pound to decline. The question of importance concerning this relationship is, "What factor or association of factors tends to make the larger farms more efficient?"

Table 12 shows the results of comparing seven large farms with seven small farms of this study.

While the "small farm" group shown in table 12 had a slightly higher yield than the "large farm" group, their cost of production was considerably higher. The larger farms had an average cost of production per pound of parchment of 35 cents, while on the small farms the cost was 40 cents.

Since labor, both hired and family, makes up by far the largest single item of cost it should receive first consideration in detecting differences attributable to scale. It cost small farms $221 more per acre for labor than it did large farms. This amounts

TABLE 12. Cost and return comparison of large vs. small farms for selected farms in the Kona district, 1955–56 crop year

ACRES	PER ACRE					
	Total cost	Parchment yield	Hired labor	Family labor	Total labor	Fertilizer
	Dollars	*Pounds*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
6 to 18	947	2,739	309	216	525	95
1 to 6	1,157	2,888	210	536	746	96

to about 303 hours of labor. This extra labor input was entirely family labor but it brought in very little extra return to the farm. Had this additional labor input been applied over a greater number of acres its earnings would have been much greater.

It is up to each farmer to decide for himself whether or not to expand the size of his present farm. Many factors other than those discussed in this study should be considered. Among them are: (1) present size and production efficiency, (2) availability of suitable new land, (3) availability of capital, (4) family labor resources, (5) method of production; i.e. cherry or parchment, (6) future of coffee prices, and (7) family income needed. However, as long as there is a positive margin between cost of production and price received, larger farms will tend to be more profitable.

Fertilizer vs. Yield

Fertilizer is among the cost items most closely associated with yield of coffee. Figure 8 shows the effect which fertilizer had on yields. The data for plotting the graph came from tables 10 and 11 of the text. Within the range of fertilizer inputs shown on graph, it would have paid to apply considerably more fertilizer than the average amount which costs farmers $93 per acre. For every additional dollar invested in fertilizer the average increase in yield would have been 17.5 pounds of parchment coffee. Of course, other expenses besides the fertilizer would have to be paid from the return derived from the sale of these 17.5 pounds, but such costs would be much less than proportionate to the increase in value. The reason that costs are not proportionate to added yield is that fixed costs are spread further, heavy yielding trees require less picking time per pound picked, and the cost of such operations as weed control are independent of yield.

The straight-line relationship between amount of fertilizer and yield would apply only within a narrow range of inputs. With successive increases in fertilizer applications the response of yield to each application would eventually decline. However, it is evident from the relationship of the data in figure 8 that fertilizer applications as made by farms in this study during the 1955–56 crop year could have been increased considerably before diminishing returns set in.

The Effect of Price Changes on Income

The price of coffee is probably the most important single factor which affects farm income. Prices paid for coffee characteristically fluctuate violently over time, thus giving rise to a feast or famine economy on the individual farm. Present studies

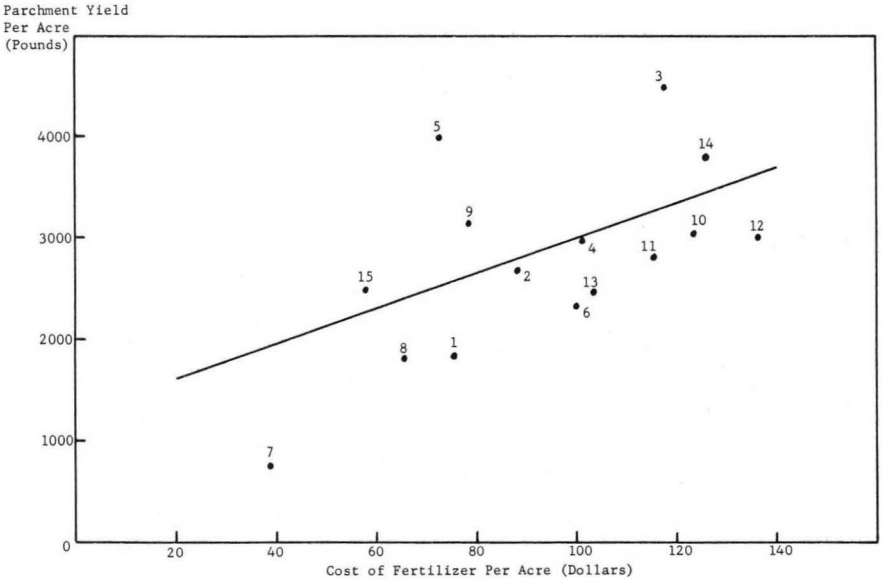

FIGURE 8. **Relation between cost of fertilizer per acre and parchment yield per acre, selected farms in the Kona district, 1955–56 crop year.**

indicate that the cost of producing coffee on the other hand changes very little from year to year when it is calculated on a per acre basis. When cost is calculated on a per pound basis it is much more changeable due to changes in yields. Even so, there is probably more stability in the cost of production per pound than there is in coffee price.

In order to show the effect of coffee price on farm income the cost characteristics of the average farm in this study were selected, cost of production being calculated on a cash cost basis as shown in table 3. The average farm in table 3 had the following characteristics:

Acres in farm	6.34
Per acre cost:	
Land	$ 21
Hired labor	$268
Miscellaneous expenses	$261
Total cash cost	$550
Yield of parchment per acre	2,689 pounds

The cash cost per pound of parchment produced was as follows:

Land	0.79¢
Hired labor	9.97¢
Other	9.72¢
Total cash cost	20.48¢

Figure 9 shows the effect which various prices would have on family income under the indicated conditions of production.

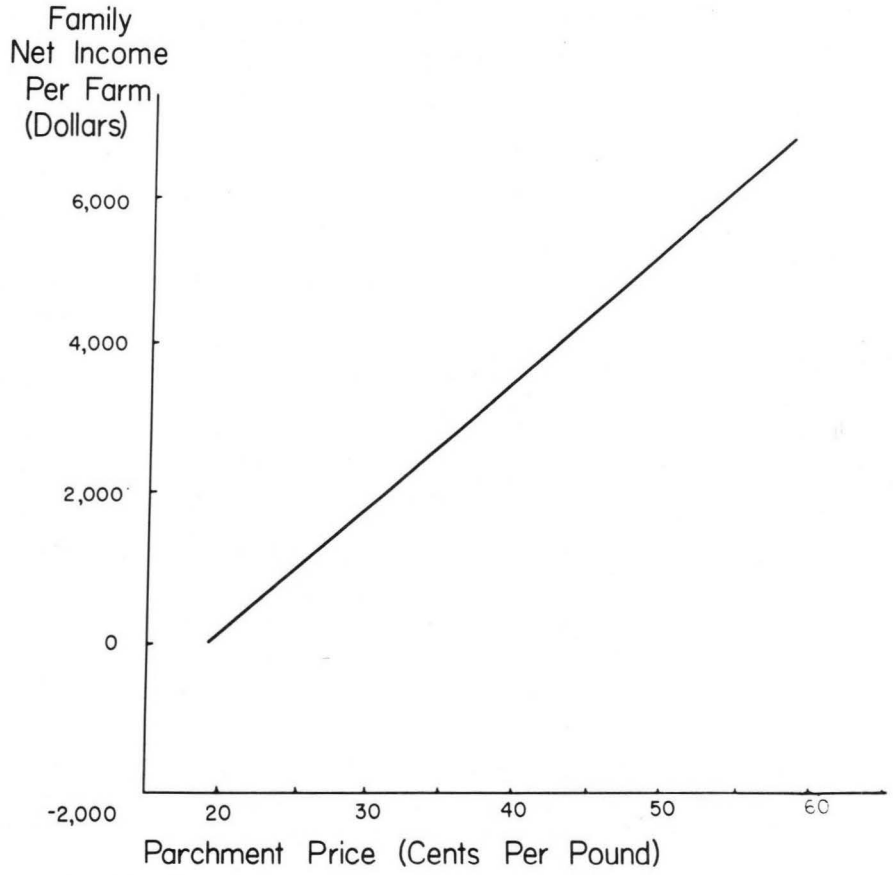

FIGURE 9. The effect of price changes on family net income, for the average of selected farms in this study in the Kona district, 1955–56 crop year.

SUMMARY

Coffee production makes an important contribution to the agricultural economy of the Territory, amounting in value of marketings to $5,480,000 in 1956. In recent years there has been a rapid expansion of Hawaii's coffee acreage in response to higher world coffee prices, but not nearly so rapid as the ill-advised coffee expansion which took place at the turn of the century. The biggest single threat to the economic well-being of this industry is the constantly shifting world coffee price.

Coffee growers in Kona are faced each year with certain cash costs which they must pay in order to stay in business. For every acre farmed, the average farmer in this study actually paid out $550, of which $21 was for land, $268 for hired labor, and $261 for miscellaneous expenses including fertilizer and weedicide. Cash costs do not include many production costs such as depreciation, interest, and return to family labor. When all costs chargeable to coffee production were considered, in-

cluding family labor at 73 cents per hour, the cost of production became $981 per acre. On the basis of the average yield in the crop year 1955–56, of 2,689 pounds of parchment per acre, the total cost of production per pound was 36 cents. Should the price of parchment fall below 36 cents per pound, the farm family would be making less than hired labor which averaged 73 cents per hour.

There are two advantages Kona coffee producers enjoy over producers in other countries: (1) a high quality, distinctive product; and (2) very high yields per acre. The quality of Kona coffee has declined and some evidence indicates that centralized processing may be the answer to this problem.

In many cases Kona coffee farms are too small to provide a sufficient family income. Larger coffee farms would increase the volume of business and at the same time lower the cost of production per pound through the economies of scale. On smaller farms it is possible to add to family income by increasing the labor input by the family, but at a relatively low rate per hour.

During the crop year 1955–56, increased applications of fertilizer would have lowered the cost of production per pound of coffee. While additional fertilizer would have increased the cost of production, the value of the added yield would have more than compensated for the expense.

Based on cash costs only, and, judging from the performance of the average farm in this study, the price of parchment would have to drop to 21 cents per pound before family income reaches zero.

APPENDIX

TABLE A–1. Capital investments per farm for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	LAND	BUILDINGS	MACHINERY	OTHER	TOTAL
			Dollars			*Dollars*
1	4.50	11,250	1,350	1,095	500	14,195
2	5.00	12,500	825	650	250	14,225
3	6.20	12,400	1,592	1,465	250	15,707
4	5.00	12,500	1,150	440	200	14,290
5	1.00	3,000	600	400	—	4,000
6	8.00	20,000	1,450	775	150	22,375
7	4.50	4,500	1,150	584	375	6,609
8	8.50	21,250	1,375	572	325	23,522
9	2.75	9,625	403	317	150	10,495
10	6.00	12,000	1,125	700	200	14,025
11	9.29	27,870	3,425	1,285	875	33,455
12	8.00	16,000	2,050	988	500	19,538
13	4.00	8,000	1,050	1,275	212	10,537
14	5.25	10,500	1,066	1,067	250	12,883
15	17.16	34,320	2,455	2,962	250	39,987
Total	95.15	215,715	21,066	14,575	4,487	255,843
All farms	6.34	14,381	1,404	972	299	17,056
Percent of total		84	8	6	2	100

TABLE A–2. Cash costs (out-of-pocket costs) and returns per farm for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	CASH COSTS				RETURNS	
		Land	Hired labor	Miscellaneous expenses	Total	Gross	Net
		Dollars			*Dollars*	*Dollars*	
1	4.50	48	—	989	1,037	4,223	3,186
2	5.00	—	1,924	1,168	3,092	6,276	3,184
3	6.20	152	3,026	2,481	5,659	14,139	8,480
4	5.00	100	581	1,274	1,955	7,403	5,448
5	1.00	125	326	501	952	2,000	1,048
6	8.00	—	324	1,381	1,705	8,570	6,865
7	4.50	14	205	463	682	1,604	922
8	8.50	397	1,175	1,215	2,787	7,689	4,902
9	2.75	110	—	499	609	4,082	3,473
10	6.00	106	3,802	2,326	6,235	8,775	2,540
11	9.29	234	3,697	3,286	7,217	13,025	5,808
12	8.00	192	3,371	3,034	6,597	11,216	4,619
13	4.00	40	875	841	1,756	4,785	3,029
14	5.25	162	2,078	2,140	4,380	10,635	6,255
15	17.16	343	4,121	3,270	7,734	19,474	11,740
Total	95.15	2,023	25,505	24,868	52,397	123,896	71,499
All farms	6.34	135	1,700	1,658	3,493	8,260	4,767
Percent of total cash cost		4	49	47	100		

TABLE A–3. Cash costs (out-of-pocket costs) and returns per pound of parchment produced for the average of selected farms in the Kona district, 1955–56 crop year

CASH COSTS				RETURNS	
Land	Hired labor	Other	Total	Gross	Net
Cents			*Cents*	*Cents*	
0.79	9.97	9.72	20.48	48.42	27.94

TABLE A–4. Total costs and returns per farm for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	TOTAL COSTS							RETURNS	
		Land	Hired labor	Family labor*	Interest	Depreciation	Miscellaneous expenses	Total	Gross	Net
					Dollars			*Dollars*		*Dollars*
1	4.50	171	—	1,661	147	529	989	3,497	4,233	726
2	5.00	100	1,924	1,829	86	444	1,168	5,551	6,276	725
3	6.20	496	3,026	2,329	165	615	2,481	9,112	14,139	5,027
4	5.00	100	581	2,487	90	357	1,274	4,889	7,403	2,514
5	1.00	125	326	780	50	284	501	2,066	2,000	— 66
6	8.00	400	324	3,308	119	487	1,380	6,018	8,570	2,552
7	4.50	113	205	399	106	377	463	1,663	1,604	— 59
8†	8.50	398	1,175	1,928	114	480	1,215	5,310	7,689	2,379
9	2.75	110	—	3,404	43	125	499	4,181	4,082	— 99
10	6.00	106	3,802	947	101	554	2,327	7,827	8,775	938
11	9.29	371	3,697	1,296	279	1,599	3,286	10,528	13,025	2,497
12	8.00	192	3,371	1,026	177	691	3,034	8,491	11,216	2,725
13	4.00	40	875	1,925	127	315	841	4,123	4,875	662
14	5.25	162	2,079	2,648	119	375	2,140	7,523	10,635	3,112
15	17.16	343	4,121	2,815	283	1,705	3,270	12,537	19,474	6,937
Total	95.15	3,227	25,506	28,782	2,006	8,937	24,868	93,326	123,896	30,570
All farms	6.34	215	1,700	1,919	134	596	1,658	6,222	8,260	2,038
Percent of total cost		3	27	31	2	10	27	100		

* Family labor calculated at same rate as the average amount paid hired labor ($.73 per hour).
† On farm No. 8, both cherry and parchment were sold. Labor and gross returns were calculated as though only parchment were sold for comparison with other farms.

TABLE A–5. Total costs and returns per pound of parchment produced for the average of selected farms in the Kona district, 1955–56 crop year

TOTAL COSTS							RETURNS	
Land	Hired labor	Family labor	Interest	Depreciation	Miscellaneous expenses	Total	Gross	Net
		Cents				*Cents*		*Cents*
1.21	9.97	11.25	0.78	3.49	9.72	36.47	48.42	11.95

TABLE A–6. Per farm costs and returns to family labor for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	COSTS						RETURNS	
		Land	Hired labor	Interest	Depreciation	Miscellaneous expenses	Total	Gross	Net to family labor
				Dollars			*Dollars*	*Dollars*	
1	4.50	171	—	147	529	989	1,836	4,223	2,387
2	5.00	100	1,924	86	444	1,168	3,722	6,276	2,554
3	6.20	496	3,026	165	615	2,481	6,783	14,139	7,356
4	5.00	100	581	90	357	1,274	2,402	7,403	5,001
5	1.00	125	326	50	284	501	1,286	2,000	714
6	8.00	400	324	119	487	1,380	2,710	8,570	5,860
7	4.50	113	205	106	377	463	1,264	1,604	340
8*	8.50	398	1,175	114	480	1,215	3,382	7,689	4,307
9	2.75	110	—	43	125	499	777	4,082	3,305
10	6.00	106	3,802	101	554	2,327	6,890	8,775	1,885
11	9.29	371	3,697	279	1,599	3,286	9,232	13,025	3,793
12	8.00	192	3,371	177	691	3,034	7,465	11,216	3,751
13	4.00	40	875	127	315	841	2,198	4,785	2,587
14	5.25	162	2,079	119	375	2,140	4,875	10,635	5,760
15	17.16	343	4,121	283	1,705	3,270	9,722	19,474	9,752
Total	95.15	3,227	25,506	2,006	8,937	24,868	64,544	123,896	59,352
All farms	6.34	215	1,700	134	596	1,658	4,303	8,260	3,957

* On farm No. 8, both cherry and parchment were sold. Labor and gross returns were calculated as though only parchment were sold for comparison with other farms.

TABLE A–7. Distribution of total labor hours per farm for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	HOEING	POISONING GRASS	PRUNING	FERTILIZING	RAT CONTROL	HARVESTING	PROCESSING	OTHER JOBS	TOTAL
					Hours					*Hours*
1	4.50	—	48	112	48	8	1,894	62	104	2,276
2	5.00	19	213	282	22	28	1,423	1,092	1,122	4,201
3	6.20	50	56	450	120	16	6,758	277	282	8,009
4	5.00	—	96	368	45	—	3,873	125	152	4,659
5	1.00	—	10	75	12	5	1,364	30	28	1,524
6	8.00	224	504	384	192	3	3,204	123	96	4,730
7	4.50	—	32	68	40	8	600	63	96	907
8	8.50	10	250	320	34	100	2,294	306	52	3,366
9	2.75	—	60	426	60	12	3,841	65	200	4,664
10	6.00	—	582	419	70	6	3,553	228	181	5,039
11	9.29	308	175	883	93	70	5,662	501	308	8,000
12	8.00	—	192	888	108	10	3,265	300	112	4,875
13	4.00	—	180	144	48	6	3,684	206	52	4,320
14	5.25	28	406	1,551	86	218	2,256	479	133	5,157
15	17.16	—	72	1,416	90	16	10,337	413	300	12,644
Total	95.15	639	2,876	7,786	1,068	506	54,008	4,270	3,218	74,371
All farms	6.34	43	192	519	71	34	3,600	285	214	4,958
Percent of total labor hours		1	4	10	1	1	73	6	4	100

TABLE A–8. Distribution of miscellaneous expenses per farm for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	MISCELLANEOUS EXPENSES									
		Supplies	Repairs, maintenance	Fertilizer	Gas, other fuel	Taxes	Insurance	Water, electricity, telephone	Freight, trucking	Weedicide	Total
						Dollars					*Dollars*
1	4.50	25	169	340	117	149	49	26	—	114	989
2	5.00	56	146	442	164	143	66	18	44	89	1,168
3	6.20	53	307	731	182	247	199	32	700	30	2,481
4	5.00	13	323	506	133	125	34	24	46	70	1,274
5	1.00	2	12	73	286	69	41	18	—	—	501
6	8.00	10	—	800	164	201	71	29	—	105	1,380
7	4.50	25	112	175	48	26	30	20	—	27	463
8	8.50	90	152	556	6	172	73	28	—	138	1,215
9	2.75	—	23	216	55	80	—	14	22	89	499
10	6.00	119	149	741	377	181	275	26	342	117	2,327
11	9.29	57	877	1,073	509	273	159	101	88	149	3,286
12	8.00	305	407	1,090	655	229	148	22	93	85	3,034
13	4.00	45	80	414	21	118	64	12	13	74	841
14	5.25	372	321	662	283	229	96	31	71	75	2,140
15	17.16	567	541	991	323	373	198	110	67	100	3,270
Total	95.15	1,739	3,619	8,810	3,323	2,615	1,503	511	1,486	1,262	24,868
All farms	6.34	116	241	587	222	175	100	34	99	84	1,658
Percent of total		7	15	35	13	11	6	2	6	5	100

TABLE A–9. Distribution of miscellaneous expenses per pound of parchment produced for selected farms in the Kona district, 1955–56 crop year

SUPPLIES	REPAIRS, MAINTENANCE	FERTILIZER	FUEL	TAXES	INSURANCE	WATER, ELECTRICITY, TELEPHONE	FREIGHT	WEEDICIDE	TOTAL
				Cents					*Cents*
0.68	1.41	3.44	1.30	1.02	0.59	0.20	0.58	0.49	9.715

TABLE A–10. Fertilizer inputs and cost per farm for selected farms in the Kona district, 1955–56 crop year

FARM NUMBER	ACRES PER FARM	TYPE OF FERTILIZER								TOTAL COST PER FARM ALL FERTILIZERS
		6–10–20		10–5–20		20–0–0		Lime		
		Amount applied	Cost	Amount applied	Cost	Amount applied	Cost	Amount applied	Cost	
		Pounds	*Dollars*	*Pounds*	*Dollars*	*Pounds*	*Dollars*	*Pounds*	*Dollars*	*Dollars*
1	4.50			7,300	340					340
2	5.00			8,500	432	200	10			442
3	6.20			14,500	731					731
4	5.00			10,800	506					506
5	1.00			1,600	73					73
6	8.00			17,100	800					800
7	4.50			3,500	175					175
8	8.50	4,000	262	4,500	294					556
9	2.75			6,000	216					216
10	6.00			16,000	624	3,000	117			741
11	9.29			16,000	837	4,500	236			1,073
12	8.00			16,000	943	2,500	147			1,090
13	4.00			6,400	339			4,000	75	414
14	5.25			10,500	391			7,300	271	662
15	17.16			14,000	771	4,000	220			991
Total	95.15	4,000	262	152,700	7,472	14,200	730	11,300	346	8,810
All farms	6.34	267	17	10,180	498	947	49	753	23	587

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